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Increasing the Voltage Droop Compensation Range in Generalized Bipolar Solid-State Marx Modulador

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The Marx generator, also known as switched capacitor voltage multipliers, is one of the most used topology to generate high-voltage unipolar or bipolar pulses. The Marx generator is composed of n capacitors, charged by a parallel connection to the power supply and discharged to the load by a series connection. The connections are enabled using switching power semiconductors. Current semiconductors allow high pulse repetition rate, duty cycle adjustment and are capable to deal with different type of loads.
Among various characteristics of the solid-state Marx modulators, the flatness of the output voltage is an issue for applications such as biological or food industry that requires high energy and long pulses (i.e. dozens of microseconds), as the capacitors voltage droops. Several authors have presented different droop corrections for unipolar Marx type circuits [1, 2], based on auxiliary stages or "bouncer"circuits. The author [3] has developed a scheme of resonant type voltage droop compensation for solid-state bipolar Marx modulator. However, this compensation scheme is limited to a certain percentage of bipolar pulse voltage droop.
The increase of the compensation of the voltage droop of the bipolar pulse, based on resonant circuit is evaluated for generalized solid-state bipolar Marx modulator, using low cost circuitry, design and control.

[1] Cassel, R.L.: "Pulsed Voltage Droop Compensation for Solid-State Marx Modulator", in Proceedings of the IEEE International Power Modulators and High Voltage Conference, May 2008, pp. 117 –119.
[2] Tang, Tao; Burkhart, Craig P.; Nguyen, Minh N.: "A vernier regulator for ILC Marx droop compensation" , in IEEE Pulsed Power Conference, pp. 1402-1405, June 2009.
[3] Hiren Canacsinh, Luís M. Redondo, J. Fernando Silva, Beatriz Borges: "Voltage Droop Compensation Based on Resonant Circuit for Generalized High Voltage Solid-State Marx Modulator", in IEEE Applied Power Electronics Conference and Exposition, Long Beach, California, USA, 20-24 March, 2016.

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